CLAIMS

What is claimed is:

1. A method of producing an antibody to a polypeptide comprising:

inoculating an animal with a polypeptide selected from the group consisting of:

(a) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 1 (Pro), to amino acid number 6 (Asp);

(b) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 26 (Ser), to amino acid number 32 (Pro);

(c) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 41 (Lys), to amino acid number 47 (Asp);

(d) a polypeptide consisting of the amino acid sequence of SEQ ID NO:2 from amino acid number 49 (Val), to amino acid number 62 (Cys);

(e) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 41 (Lys) to amino acid number 62 (Cys);

(f) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 84 (Ala) to amino acid number 97 (Ser);

(g) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 103 (Thr) to amino acid number 108 (Asp);

(h) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 130 (Arg) to amino acid number 135 (His);

(i) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 164 (Gly) to amino acid number 166 (Lys);

(j) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 175 (Tyr), to amino acid number 179 (Glu);

(k) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 193 (Lys) to amino acid number 196 (Ala);

(l) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 203 (Lys) to amino acid number 209 (Thr); and

(m) a polypeptide consisting of the amino acid sequence of SEQ ID NO:3; and

(n) a polypeptide consisting of the amino acid sequence of SEQ ID NO:4; and

wherein the polypeptide elicits an immune response in the animal to produce the antibody; and

isolating the antibody from the animal; and

wherein the antibody specifically binds to an IL-22RA polypeptide (SEQ ID NO:2 or SEQ ID NO:3); and reduces the activity of either IL-20 (SEQ ID NO:8) or IL-22 (SEQ ID NO:6).

2. The method according to claim 1, wherein the antibody produced by the method reduces the pro-inflammatory activity of either IL-20 (SEQ ID NO:8) or IL-22 (SEQ ID NO:6).

3. The method of claim 1, wherein the antibody produced by the method neutralizes the interaction of either IL-20 (SEQ ID NO:8) or IL-22 (SEQ ID NO:6) with IL-22RA (SEQ ID NO:2).

4. The method of claim 3, wherein the neutralization by the antibody is measured by showing neutralization of either IL-20 (SEQ ID NO:8) or IL-22 (SEQ ID NO:6) in an *in vitro* a cell-based neutralization assay.

5. The method of claim 1, wherein the antibody produced by the method reduces the pro-inflammatory activity of both IL-20 (SEQ ID NO:8) and IL-22 (SEQ ID NO:6).

6. The method of claim 1, wherein the antibody produced by the method neutralizes the interaction of both IL-20 (SEQ ID NO:8) and IL-22 (SEQ ID NO:6) with IL-22RA (SEQ ID NO:2).

7. The method of claim 3, wherein the neutralization by the antibody is measured by showing neutralization of both IL-20 (SEQ ID NO:8) and IL-22 (SEQ ID NO:6) in an *in vitro* a cell-based neutralization assay.

8. An antibody produced by the method of claim 1, which binds to a polypeptide of SEQ ID NO:2 or SEQ ID NO:3.

9. The antibody of claim 2, wherein the antibody is (a) a polyclonal antibody, (b) a murine monoclonal antibody, (c) a humanized antibody derived from (b), (d) an antibody fragment, or (e) a human monoclonal antibody.

10. The antibody of claim 2, wherein the antibody further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, or toxin.

11. The antibody of claim 9, wherein the antibody further comprises PEGylation.

12. The antibody of claim 5, wherein the antibody is (a) a polyclonal antibody, (b) a murine monoclonal antibody, (c) a humanized antibody derived from (b), (d) an antibody fragment, or (e) a human monoclonal antibody.

13. The antibody of claim 5, wherein the antibody further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

14. The antibody of claim 12, wherein the antibody further comprises PEGylation.

15. An antibody or antibody fragment that binds to a polypeptide comprising a sequence of amino acid residues as shown in SEQ ID NO:3; and

reduces the pro-inflammatory activity of either IL-20 (SEQ ID NO:8) or IL-22 (SEQ ID NO:6).

16. The antibody or antibody fragment according to claim 15, wherein the antibody or antibody fragment reduces the pro-inflammatory activity of both IL-20 (SEQ ID NO:8) and IL-22 (SEQ ID NO:6).

17. The antibody or antibody fragment according to claim 15, wherein the or antibody fragment is (a) a polyclonal antibody, (b) a murine monoclonal antibody, (c) a humanized antibody derived from (b), (d) an antibody fragment, or (e) a human monoclonal antibody.

18. The antibody or antibody fragment according to claim 15, wherein the antibody further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

19. The antibody of claim 17, wherein the antibody further comprises PEGylation.

20. The antibody or antibody fragment according to claim 16, wherein the or antibody fragment is (a) a polyclonal antibody, (b) a murine monoclonal antibody, (c) a humanized antibody derived from (b), (d) an antibody fragment, or (e) a human monoclonal antibody.

21. The antibody or antibody fragment according to claim 16, wherein the antibody further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

22. The antibody of claim 20, wherein the antibody further comprises PEGylation.

23. A method for reducing or inhibiting either IL-22-induced or IL-20-induced proliferation or differentiation of hematopoietic cells and hematopoietic cell progenitors comprising culturing bone marrow or peripheral blood cells with a composition

comprising an amount of an antibody according to claim 3 sufficient to reduce proliferation or differentiation of the hematopoietic cells in the bone marrow or peripheral blood cells as compared to bone marrow or peripheral blood cells cultured in the absence of the antibody.

24. The method of claim 23, wherein the hematopoietic cells and hematopoietic progenitor cells are lymphoid cells.

25. The method of claim 24, wherein the lymphoid cells are macrophages or T cells.

26. A method of reducing IL-22-induced or IL-20-induced inflammation comprising administering to a mammal with inflammation an amount of a composition of an antibody according to claim 3 sufficient to reduce inflammation.

27. A method for reducing or inhibiting IL-22-induced and IL-20-induced proliferation or differentiation of hematopoietic cells and hematopoietic cell progenitors comprising culturing bone marrow or peripheral blood cells with a composition comprising an amount of an antibody according to claim 5 sufficient to reduce proliferation or differentiation of the hematopoietic cells in the bone marrow or peripheral blood cells as compared to bone marrow or peripheral blood cells cultured in the absence of the antibody.

28. The method of claim 27, wherein the hematopoietic cells and hematopoietic progenitor cells are lymphoid cells.

29. The method of claim 28, wherein the lymphoid cells are macrophages or T cells.

30. A method of reducing IL-22-induced and IL-20-induced inflammation comprising administering to a mammal with inflammation an amount of a composition of an antibody according to claim 5 sufficient to reduce inflammation.

31. A method for reducing or inhibiting IL-22-induced and IL-20-induced proliferation or differentiation of hematopoietic cells and hematopoietic cell progenitors comprising culturing bone marrow or peripheral blood cells with a composition comprising an amount of an antibody or antibody fragment according to claim 15 sufficient to reduce proliferation or differentiation of the hematopoietic cells in the bone marrow or peripheral blood cells as compared to bone marrow or peripheral blood cells cultured in the absence of the antibody or antibody fragment.

32. The method of claim 31, wherein the hematopoietic cells and hematopoietic progenitor cells are lymphoid cells.

33. The method of claim 32, wherein the lymphoid cells are macrophages or T cells.

34. A method of reducing IL-22-induced and IL-20-induced inflammation comprising administering to a mammal with inflammation an amount of a composition of an antibody or antibody fragment according to claim 15 sufficient to reduce inflammation.

35. A method for reducing or inhibiting IL-22-induced and IL-20-induced proliferation or differentiation of hematopoietic cells and hematopoietic cell progenitors comprising culturing bone marrow or peripheral blood cells with a composition comprising an amount of an antibody or antibody fragment according to claim 16 sufficient to reduce proliferation or differentiation of the hematopoietic cells in the bone marrow or peripheral blood cells as compared to bone marrow or peripheral blood cells cultured in the absence of the antibody.

36. The method of claim 35, wherein the hematopoietic cells and hematopoietic progenitor cells are lymphoid cells.

37. The method of claim 36, wherein the lymphoid cells are macrophages or T cells.

38. A method of reducing IL-22-induced and IL-20-induced inflammation comprising administering to a mammal with inflammation an amount of a composition of an antibody or antibody fragment according to claim 16 sufficient to reduce inflammation.

39. A method of suppressing an inflammatory response in a mammal with inflammation comprising:

(1) determining a level of serum amyloid A protein;

(2) administering a composition comprising an antibody according to claim 3 in an acceptable pharmaceutical vehicle;

(3) determining a post administration level of serum amyloid A protein;

(4) comparing the level of serum amyloid A protein in step (1) to the level of serum amyloid A protein in step (3), wherein a lack of increase or a decrease in serum amyloid A protein level is indicative of suppressing an inflammatory response.

40. A method of suppressing an inflammatory response in a mammal with inflammation comprising:

(1) determining a level of serum amyloid A protein;

(2) administering a composition comprising an antibody according to claim 5 in an acceptable pharmaceutical vehicle;

(3) determining a post administration level of serum amyloid A protein;

(4) comparing the level of serum amyloid A protein in step (1) to the level of serum amyloid A protein in step (3), wherein a lack of increase or a decrease in serum amyloid A protein level is indicative of suppressing an inflammatory response.

41. A method of suppressing an inflammatory response in a mammal with inflammation comprising:

(1) determining a level of serum amyloid A protein;

(2) administering a composition comprising an antibody according to claim 15 in an acceptable pharmaceutical vehicle;

(3) determining a post administration level of serum amyloid A protein;

(4) comparing the level of serum amyloid A protein in step (1) to the level of serum amyloid A protein in step (3), wherein a lack of increase or a decrease in serum amyloid A protein level is indicative of suppressing an inflammatory response.

42. A method of suppressing an inflammatory response in a mammal with inflammation comprising:

(1) determining a level of serum amyloid A protein;

(2) administering a composition comprising an antibody according to claim 16 in an acceptable pharmaceutical vehicle;

(3) determining a post administration level of serum amyloid A protein;

(4) comparing the level of serum amyloid A protein in step (1) to the level of serum amyloid A protein in step (3), wherein a lack of increase or a decrease in serum amyloid A protein level is indicative of suppressing an inflammatory response.

43. A method of treating a mammal afflicted with an inflammatory disease in which IL-22 or IL-20 plays a role, comprising:

administering an antagonist of IL-22 or IL-20 to the mammal such that the inflammation is reduced, wherein the antagonist comprises (i) an antibody, antibody fragment, or binding polypeptide that specifically binds a polypeptide or polypeptide fragment of IL-22RA (SEQ ID NO:3) or (ii) a polypeptide or polypeptide fragment of IL-22RA (SEQ ID NO:3); and

wherein the inflammatory activity of either IL-22 (SEQ ID NO:6) or IL-20 (SEQ ID NO:8) is reduced.

44. The method of claim 43, wherein the disease is a chronic inflammatory disease.

45. The method of claim 44, wherein the disease is a chronic inflammatory disease comprising inflammatory bowel disease, ulcerative colitis, Crohn's disease, arthritis, atopic dermatitis, or psoriasis.

46. The method of claim 43, wherein the disease is an acute inflammatory disease.

47. The method of claim 46, wherein the disease is an acute inflammatory disease comprising endotoxemia, septicemia, toxic shock syndrome or infectious disease.

48. The method of claim 43, wherein the antibody, antibody fragment, or binding polypeptide further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

49. A method of treating a mammal afflicted with an inflammatory disease in which IL-22 and IL-20 plays a role, comprising:

administering an antagonist of both IL-22 and IL-20 to the mammal such that the inflammation is reduced, wherein the antagonist comprises (i) an antibody, antibody fragment, or binding polypeptide that specifically binds a polypeptide or polypeptide fragment of IL-22RA (SEQ ID NO:3) or (ii) a polypeptide or polypeptide fragment of IL-22RA (SEQ ID NO:3); and

wherein the inflammatory activity of both IL-22 (SEQ ID NO:6) and IL-20 (SEQ ID NO:8) is reduced.

50. The method of claim 49, wherein the disease is a chronic inflammatory disease.

51. The method of claim 50, wherein the disease is a chronic inflammatory disease comprising inflammatory bowel disease, ulcerative colitis, Crohn's disease, arthritis, atopic dermatitis, or psoriasis.

52. The method of claim 49, wherein the disease is an acute inflammatory disease.

53. The method of claim 52, wherein the disease is an acute inflammatory disease comprising endotoxemia, septicemia, toxic shock syndrome or infectious disease.

54. The method of claim 49, wherein the antibody, antibody fragment, or binding polypeptide further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

55. An antibody comprising a monoclonal antibody that specifically binds to an antigenic epitope of human IL-22RA (SEQ ID NO:3) selected from the group consisting of:

(a) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 1 (Pro), to amino acid number 6 (Asp);

(b) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 26 (Ser), to amino acid number 32 (Pro);

(c) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 41 (Lys), to amino acid number 47 (Asp);

(d) an epitope consisting of the amino acid sequence of SEQ ID NO:2 from amino acid number 49 (Val), to amino acid number 62 (Cys);

(e) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 41 (Lys) to amino acid number 62 (Cys);

(f) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 84 (Ala) to amino acid number 97 (Ser);

(g) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 103 (Thr) to amino acid number 108 (Asp);

(h) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 130 (Arg) to amino acid number 135 (His);

(i) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 164 (Gly) to amino acid number 166 (Lys);

(j) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 175 (Tyr), to amino acid number 179 (Glu);

(k) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 193 (Lys) to amino acid number 196 (Ala);

(l) an epitope consisting of the amino acid sequence of SEQ ID NO:3 from amino acid number 203 (Lys) to amino acid number 209 (Thr); and

(m) an epitope consisting of the amino acid sequence of SEQ ID NO:3; and

(n) an epitope consisting of the amino acid sequence of SEQ ID NO:4; and

wherein the antibody reduces or neutralizes the activity of either human IL-22 (SEQ ID NO:6) or IL-20 (SEQ ID NO:8).

56. The antibody of claim 55, wherein the antibody reduces or neutralizes the activity of both human IL-22 (SEQ ID NO:6) and IL-20 (SEQ ID NO:8).

57. The antibody of claim 55, wherein the antibody is selected from the group consisting of: (a) a murine monoclonal antibody, (b) a humanized antibody derived from (a), (c) an antibody fragment, and (d) a human monoclonal antibody.

58. The antibody of claim 57, wherein the antibody further comprises PEGylation.

59. The antibody of claim 56, wherein the antibody is selected from the group consisting of: (a) a murine monoclonal antibody, (b) a humanized antibody derived from (a), (c) an antibody fragment, and (d) a human monoclonal antibody.

60. The antibody of claim 59, wherein the antibody further comprises PEGylation.

61. A method of treating a pathological condition in a subject associated with IL-22RA activity comprising administering an effective amount of the antibody of claim 55, thereby treating said pathological condition.

62. The method of claim 61, wherein said pathological condition is a chronic inflammatory condition.

63. The method of claim 62, wherein said chronic inflammatory condition comprising inflammatory bowel disease, ulcerative colitis, Crohn's disease, arthritis, atopic dermatitis, or psoriasis.

64. The method of claim 61, wherein said pathological condition is an acute inflammatory condition.

65. The method of claim 64, wherein said acute inflammatory condition comprises endotoxemia, septicemia, toxic shock syndrome, or infectious disease.

66. A method of treating a mammal afflicted with an inflammatory disease in which IL-22RA plays a role, comprising:

administering an antagonist of IL-22RA to the mammal such that the inflammation is reduced, wherein the antagonist comprises an antibody, antibody fragment, or binding polypeptide that specifically binds a polypeptide or polypeptide fragment of IL-22RA (SEQ ID NO:3); and

wherein the inflammatory activity is reduced.

67. The method of claim 66, wherein the disease is a chronic inflammatory disease.

68. The method of claim 67, wherein the disease is a chronic inflammatory disease comprising inflammatory bowel disease, ulcerative colitis, Crohn's disease, arthritis, atopic dermatitis, or psoriasis.

69. The method of claim 66, wherein the disease is an acute inflammatory disease.

70. The method of claim 69, wherein the disease is an acute inflammatory disease comprising endotoxemia, septicemia, toxic shock syndrome or infectious disease.

71. The method of claim 66, wherein the antibody, antibody fragment, or binding polypeptide further comprises a radionuclide, enzyme, substrate, cofactor, fluorescent marker, chemiluminescent marker, peptide tag, magnetic particle, drug, or toxin.

72. The method of claim 66, wherein the antibody, antibody fragment, or binding polypeptide further comprises, wherein the antibody further comprises PEGylation.

73. A method of reducing inflammation comprising administering to a mammal with inflammation an amount of a composition of an antibody according to claim 55 sufficient to reduce inflammation.